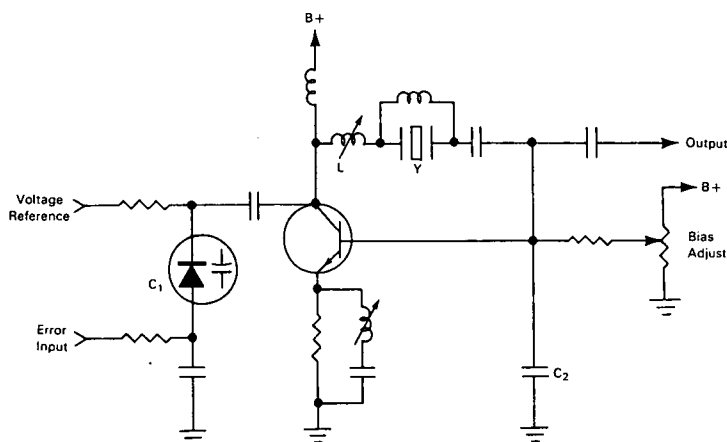


## NASA TECH BRIEF



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### Voltage Controlled Oscillator Is Easily Aligned, Has Low Phase Noise



**The problem:** To design a voltage controlled oscillator (VCO) that can be easily adjusted for optimum performance. A conventional VCO, using crystal control and mutual inductance feedback coupling, requires a considerable amount of trial and error experimentation to select the best crystal and circuit parameters for stable operation and minimum phase noise.

**The solution:** A VCO that can be represented by a simple equivalent rf circuit for determining nominal values of rf circuit parameters and in which the crystal drive level can be easily adjusted for minimum phase noise.

**How it's done:** The only components in the VCO which are part of the rf circuitry are the control crystal Y, the series inductor L, which is used to tune the external circuit to the crystal resonance, the voltage variable capacitor C<sub>1</sub>, the base load capacitor C<sub>2</sub>, and the transistor. These components can be represented by an equivalent rf circuit and their nominal values can

be chosen to make the oscillator loop gain greater than unity. The oscillator can be adjusted for optimum performance by varying the circuit parameters. The "bias adjust" control may be used to determine the gain of the transistor, thus varying the crystal drive level and signal-to-noise ratio at the transistor input to obtain minimum phase noise.

**Notes:**

1. This innovation should be of general interest to the electronics industry.
2. Inquiries concerning this innovation may be directed to:

Technology Utilization Officer  
Jet Propulsion Laboratory  
4800 Oak Grove Drive  
Pasadena, California, 91103  
Reference: B65-10223

**Patent status:** NASA encourages commercial use of this innovation. No patent action is contemplated.

Source: Richard L. Sydnor  
(JPL-510)

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